Petter Osmundsen and Marius Sikveland

VOLATILITY AND RISK SHARING IN EUROPEAN GAS MARKETS

Marius Sikveland: Corresponding author. Address: University of Stavanger, Department of Industrial Economics, 4036 Stavanger, Norway, Phone: +47 480 36 933, e-mail: Marius.Sikveland@uis.no

Overview

If buying gas in the spot market is risky - in terms of price and volume - a risk averse buyer could pay a premium for risk reduction. At the same time, a risk averse seller could give a discount to avoid risk.

Hence, most of the European gas is sold by means of long-term supply contracts. In regulating contracting volumes, the exporting and the importing companies have conflicting interests.1 Since gas storage is expensive and in limited supply, the importer would like to have flexibility with respect to volumes, thus being able to adjust to changes in downstream demand. Demand fluctuates, especially over the seasons, with a higher demand in Winter than in Summer. The exporters, on the other hand, have to sink large irreversible investments in extraction, processing, and transportation facilities. Before doing so, they would like to have assurances that they will be able to sell the gas over a considerable period of time, thus securing a return on their investments. Also, to exploit the extraction, processing and transportation capacity, the seller would prefer to deliver a stable gas stream at maximum capacity utilisation. The exporter would – before making large irreversible investments – prefer a specific price, a minimum price, or other types of price guarantees for the entire period of delivery. The buyers, on the other hand, would like the gas price to be responsive to the price of substitutes (such as oil products), so that they are able to sell the gas. These trade-offs are made in the long term take-or-pay contracts that regulate the majority of gas volumes in Europe.

However, gas is to an increasing extent sold in spot markets. We raise the question whether the increased volumes in these markets - by increased liquidity - reduce the risk of spot trading (liquidity effect). Is price volatility reduced over time in pace with increasing trading volumes? This is not a straight forward question, as price volatility, ceteris paribus, normally increases with increasing price levels (price effect), see e.g. Geman (2005). Thus, to measure the true impact of enhanced liquidity, price level effects need to be isolated. We also compare spot and contract prices, to examine the price effect of risk reduction (risk premiums).

Gas in the UK is primarily traded in the Over The Counter market. The National Balancing Point gives the reference price for many forward transactions and for the International Petroleum Exchange futures contracts. Zeebrugge (ZEE) in Belgium is the arrival point for the Interconnector, a pipeline connecting the UK market to Continental Europe. The interconnector became operational in 1998 which, and brought to the UK the European price of gas which is closely linked to oil products. The Title Transfer Facility (TTF) hub in the Netherlands is one of the most recently developed gas hubs in Europe. The hub, operational since 2003 rapidly maturing into an important trading point for gas market participants in Northwest Europe.

Methods

This paper focuses on the volatility, correlation and average prices in different European gas markets. Standard deviation in monthly average prices are annualised and compared. We also investigate correlation between Brent Blend, oil-linked gas price, and different

[1] See Asche et al. (2002)

spot gas prices (proxied by day ahead prices because of lack of within day data). Spot prices are collected from Argus, Platts, and German oil linked gas prices (proxy for contract price) are form the Federal Ministry of Economics and Technology in Germany.

Results

NBP has the highest level of volatility. Zeebugge has the highest level of volatility in continental Europe. The correlation between NBP and Zeebrugge is 0,99. This is not surprising given that the two markets are connected via the Interconnector. The more liquid gas spot markets in Europe have higher volatility. From the correlation matrix (Table 1) we see that the more liquid the market, the more independently it is priced from Brent blend. Illiquid markets to a larger extent use Brent Blend as a price reference.

We can divide Figure 1 into three distinct periods. We show the mean and standard deviation of those periods in figure 2 and Table 2. The first period starts in October 96 and ends September 99. In this period we have relatively low gas prices, and low standard deviation. From 1999-2003 we see that volatility and price increases (NPB price is slightly lower). From 2003 - October 2006 prices increase again, but volatility in Brent, oil-linked gas price and HH decrease. Volatility in European spot gas markets increase in this period.

Figure 1: Energy prices in USD/MMBtu

Table 1: Correlation matrix

	Brent	NBP	ZEE	HH	TTF*	Oil linked
Dated brent	1					
NBP	0.71	1				
ZEE	0.73	0.99	1			
HH	0.69	0.72	0.71	1		
TTF*	0.73	0.82	0.84	0.37	1	
Oil linked	0.93	0.74	0.76	0.67	0.80	1

*TTF data from January 2004

Figure 2: Mean price and standard deviation

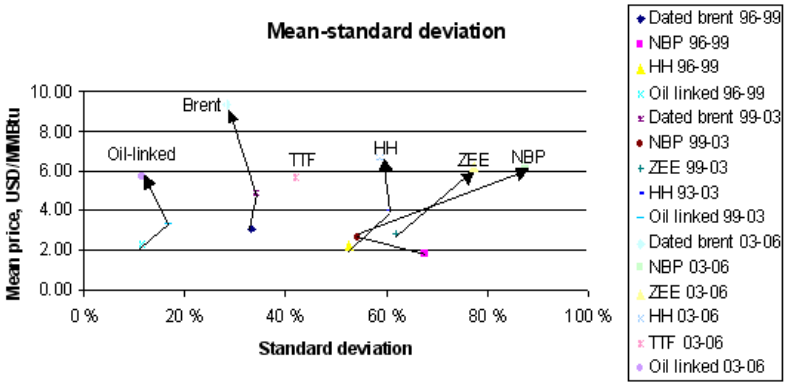

Table 2: Mean and standard deviation

1996-1999						
	Dated brent 96-99	NBP 96-99	ZEE	HH 96-99	TTF	Oil linked 96-99
Mean	3.09	1.78	n/a	2.25	n/a	2.33
Std.dev	33 %	68 %	n/a	52 %	n/a	11 %
1999-2003						
	Dated brent 99-03	NBP 99-03	ZEE 99-03	HH 93-03	TTF	Oil linked 99-03
Mean	4.93	2.62	2.78	3.95	n/a	3.34
Std.dev	34 %	54 %	62 %	60 %	n/a	17 %
2003-2006						
	Dated brent 03-06	NBP 03-06	ZEE 03-06	HH 03-06	TTF 03-06	Oil linked 03-06
Mean	9.37	6.18	6.18	6.66	5.66	5.71
Std.dev	28 %	88 %	77 %	59 %	42 %	12 %

Conclusions

As mentioned, a liquidity effect is likely to reduce volatility, whereas the opposite effect is expected from increased price level. Comparing the period 1996-1999 with 1999-2003, we see that the price effect dominates for all price series except from NBP. Comparing 1999-2003 with 2003-2006 we find that the liquidity effect dominates for all price series except NBP and Zeebrugge.

The oil-linked gas price (Germany) sell at a premium compared to the spot market prices in Europe in the first two periods, but has considerably lower volatility in all periods. The relatively low volatility confirms the take-or-pay contract as a means for risk reduction. The absolute price levels of spot and contract gas are not directly comparable, however, as the take-or-pay contracts contain flexibility options (swing) that are valuable to the buyers. Our findings provide an indication of the level of this option value.

References

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